DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
WATER QUALITY MONITORING AND ASSESSMENT SECTION
WATERSHED INFORMATION SHEET

# Fabius River Basin-07110002, 07110003

## Basin Description

The Fabius River basin lies in northeastern Missouri except for a very small portion of the watershed that extends into southeastern Iowa. The largest tributaries are the North, Middle and South Forks of the Fabius. These streams all flow in a southeasterly direction and join just a few miles before flowing into the Mississippi River near West Quincy. The basin is 1,435 square miles in area. The largest reservoir in the basin is Memphis No. 2 Reservoir with a surface area of 250 acres. There are five public drinking water reservoirs in this basin.

Average annual rainfall is 38 inches. Stream flow statistics for the basin are shown in Table 1.

Table 1. Stream Flow Statistics for the Fabius River Basin

| Stream/Location | Watershed Area (sq.mi.) | Period Of Record | Flow (cfs) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 90th Percentile * | Mean | Median ** | 10th Percentile *** | 7Q10 Low Flow+ |
| N. Fabius R. nr Monticello | 452 | 1922-2004 | 565 | 295 | 46 | 4.3 | 0.0 |
| Middle Fabius R. nr Monticello | 393 | 1945-2004 | 568 | 276 | 38 | 2.8 | 0.0 |
| S. Fabius R. nr Taylor | 620 | 1934-2004 | 962 | 417 | 60 | 4.4 | 0.0 |

*Flow is less than this amount 90 percent of the time
**Flow is less than this amount 50 percent of the time
***Flow is less than this amount 10 percent of the time
+ The lowest average seven consecutive day flow that occurs with a recurrence interval of 10 years.
++ Record exists for most years in this interval

The Fabius River basin lies within the Dissected Till Plains physiographic province and is characterized by a mixture of hills and open plains. Basin-wide, 51 percent of the land is pasture and hay fields, 33 percent is row crop, and 16 percent forest.

Except for areas in the lower portions of the basin where streams have incised Mississippian aged rock, the surface of the basin is glacial till overlain by loess. Glacial till is a mostly unsorted mixture of clay, sand, gravel and rock debris created and pushed southward into Missouri by the great glacial ice sheets. Loess is a windblown silt deposit. Depth of the till is highly variable but is generally less than 200 feet. Loess deposits are 4-8 feet in depth in the North and Middle Fabius watersheds and less than 4 feet in the South Fabius watershed.

The presence of the clayey till and the underlying shale beds ensure that there is very little movement of water to the subsurface. Most water movement in the basin is through the surface stream network. Water that reaches the subsurface will resurface locally when a stream valley incises a confining aquatard (an impermeable layer). Since very little water infiltrates to the subsurface, streamflow can be very high during wet weather. For the same reason, base flows, streamflow sustained only by the re-emergence of groundwater into the stream, are very low during the intervening dry periods. There are only four small springs of note in the basin. None of these sustain flow in dry weather.

## Water Quality Concerns

Acceptable water quality is defined by Missouri's Water Quality Standards [http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf ] . Streams or lakes that do not meet these standards are considered "impaired." They may not be fit for certain uses such as swimming, drinking water supply or protection of fish and other aquatic life. Waters are considered "affected" rather than "impaired" if water quality changes are less serious and state standards are not exceeded. These standards also list more than 3,600 classified streams and more than 400 classified lakes in the state. A classified stream is one that is either a permanently flowing stream or one that may stop flowing in dry weather but still maintains large pools of water that support aquatic life. Unclassified streams are the small tributaries to classified streams that typically have flowing water only during wet weather and are dry for the remainder of the year.

Water Quality in Prairie Streams
http://www.dnr.mo.gov/env/wpp/watersheds/info/wq-prairie-str.pdf

Aquatic Habitat in Prairie Streams
http://www.dnr.mo.gov/env/wpp/watersheds/info/aquatic-hab-prairie-str.pdf

### Point Source Pollution

Point source pollution is a discharge of wastewater from a single location such as a wastewater treatment plant. Wastewater treatment plants can serve industries, small businesses, subdivisions, mobile home parks, apartment complexes, or entire cities. Wastewater from residential sources such as subdivisions, apartments and mobile home parks is often referred to as "domestic wastewater" and contains primarily treated human wastes, food wastes and detergents. The primary pollutants of concern in domestic wastewater are the amount of organic matter, which is commonly reported as Biological Oxygen Demand (BOD), suspended solids, and ammonia. Industrial and commercial wastewater can be more complex and may contain, in addition to domestic wastes, heavy metals or man-made organic chemicals that can be potentially toxic. Discharges from most municipal wastewater treatment plants are usually a mixture of domestic and industrial/commercial wastewater. Most wastewater plant discharges are also typically high in nitrogen and phosphorus, two elements that act as fertilizers and can cause excessive algae growth in waters receiving these discharges.

There are 27 permitted domestic or industrial/commercial point sources that discharge a combined 1.72 million gallons per day (mgd) of treated wastewater into the waters of the Fabius River basin. There are 447 miles of classified streams in the basin, two miles of which (less than 1 percent) are known to be affected or impaired by point source wastewater discharges. There are 3.6 miles of unclassified streams that are affected or impaired by point source wastewater discharges. Wastewater discharges that affect at least 0.5 miles of their receiving streams include municipal discharges from Memphis and Lewistown.

Wastewater Treatment
http://www.dnr.mo.gov/env/wpp/watersheds/info/wastewater-treatment.pdf

**Nonpoint Source Pollution**

Nonpoint source pollution occurs when pollutants are released from numerous points. They are often spread out and difficult to identify and control. In the Fabius River basin, the most serious nonpoint problem is degradation of aquatic habitat. A total of 433 miles (97 percent) of classified streams in the basin are considered to have degraded aquatic habitat. The lack of infiltration of rainfall, when combined with local soil tillage and other land uses leads to a large amount of surface runoff during wet weather. This contributes to soil erosion and high levels of sediment deposition in streams. The quality of aquatic habitat is further impaired by removal of wooded riparian vegetation, and by the channelization, or straightening, of streams. Channelization has occurred in 91 miles (20 percent) of streams in the basin.

Storm water runoff in the Midwest can carry significant amounts of fertilizers, animal wastes, and pesticides into streams. Atrazine is an agricultural herbicide used on corn and grain sorghum. It is commonly found in storm water. Missouri's water quality standards allow no more than 3.0 ug/l Atrazine in drinking water reservoirs as a long-term average. There are five reservoirs in the Fabius basin that serve as drinking water supplies and four other towns, Baring, La Belle, Lewistown, and Edina, are served by water coming from Mark Twain Lake in the Salt River basin. Two of the drinking water reservoirs in this basin and Mark Twain Lake have had sufficient monitoring of Atrazine to establish long term averages in the lake water prior to treatment. This information is shown in Table 2.

Table 2. Long Term Average Atrazine and Cyanazine Levels in Reservoirs of the Fabius River Basin (ug/l).

| Reservoir | Average Concentration in Lake Water (ug/l) | |
|---|---|---|
| | Atrazine | Cyanazine |
| Lancaster Old Lake | 0.06 | 0 |
| Lancaster New Lake | 0.07 | 0 |
| Mark Twain Lake | 1.49 | 0 |

Drinking water reservoirs throughout northern and western Missouri are also monitored for several other common agricultural herbicides. Results of this monitoring over many years indicates that the only other herbicide that may be a human health concern in drinking water reservoirs is Cyanazine. The Federal Health Advisory Level of Cyanazine in drinking water reservoirs is 1 ug/l as a long-term average. Federal regulations require the end of all Cyanazine use in 2002.

Finished drinking water is monitored regularly at all public supplies. Finished drinking water in Missouri has been found to meet state standards for pesticides. Levels of Atrazine and other herbicides in finished drinking water supplies may be significantly lower than the amounts found in the reservoirs, if the drinking water plants take measures to reduce herbicides during the water treatment process.

Many private residences use groundwater as a drinking water supply. Studies of private well water quality in northeastern Missouri have shown that about 20 percent of all private wells sampled exceeded drinking water standards for nitrate. And 1-2 percent of wells exceeded drinking water standards or health advisory levels for pesticides, most commonly the herbicides Atrazine or Alachlor. This contamination is often caused by local land use practices or surface contamination of the wellhead and does not represent widespread contamination of the underground aquifer. Deeper aquifers are protected from surface contamination by impermeable strata.

During warm weather when stream flows are low, livestock tend to gather in and around streams. The wastes they leave behind in the water contribute to nuisance algae growths, low levels of dissolved oxygen and elevated levels of ammonia and bacteria.

## Water Quality Management

The department achieves water quality management of point source pollutants through the issuance and enforcement of wastewater discharge permits. These permits limit the amount of pollutants that can be discharged. All point source wastewater dischargers must obtain a permit and adhere to its discharge limitations. All permits require at least a level of treatment equal to national wastewater treatment standards. In

situations where these national treatment standards are not adequate to protect the streams or lakes receiving these wastewater discharges, stricter permit limits that do protect these waters are required. The permits require regular monitoring and reporting of discharge quality. The department also conducts regular inspection of wastewater treatment facilities and receiving waters.

Nonpoint source pollution is addressed through the state's nonpoint source management plan. This plan is a cooperative program between the Department of Natural Resources and other federal, state and local government agencies or organizations, local landowners and other interested citizens. The plan emphasizes addressing problems at the watershed level through the use of management practices that control nonpoint pollution. The most commonly supported practices are those that control soil erosion on agricultural and urban lands, improve quality and quantity of forage on grazing lands, protect riparian zones, and those that control runoff of animal manure, fertilizers and pesticides. The state nonpoint source management plan is a voluntary program that provides funds to help defray the cost of adopting management practices.

Since 1990, there have been 10 nonpoint source watershed projects in the basin funded by state sales tax money earmarked for soil and water conservation. These projects treated more than 42,400 acres of land, comprising about 6.5 percent of the entire basin.

Table 3. Nonpoint Source Watershed Projects in the North River Basin

| Watershed Name | County | Project Date | Watershed Size (Acres) | Acres Treated | Percent of Watershed Treated |
|---|---|---|---|---|---|
| N. Fabius R. &Downing Lake | Schuyler | 1990-94 | 1,200 | 803 | 67% |
| Hawkins Branch | Knox | 1993-97 | 5,768 | 2,595 | 45% |
| L. Troublesome Cr. | Knox | 1993-97 | 2,463 | 1,070 | 43% |
| Brushy Cr. | Schuyler | 1994-98 | 2,880 | 2,161 | 75% |
| N. Fk. Little Fabius R. | Schuyler | 1995-99 | 2,942 | 1,462 | 50% |
| Troublesome Cr. | Knox | 1992-99 | 22,958 | 18,828 | 82% |
| Monticello Basin | Lewis | 1992-99 | 12,800 | 7,510 | 59% |
| Bear Cr. | Scotland | 1993-99 | 23,120 | 8,019 | 35% |
| S. Fk. North Fabius R. | Schuyler | 2004-2011 | | | 8% |
| N. Fk. Middle Fabius R. | Scotland | 2004-2011 | | | 4% |

The Missouri Department of Natural Resources monitors water chemistry and aquatic invertebrate communities at many locations in Missouri. The department also tracks the quality of domestic, industrial and storm water discharges. These monitoring activities provide information on water quality problems, such as their specific location, pollutants, sources and possible solutions. This information guides the management activities the department takes to protect water quality in Missouri.

## Web links

US Geological Survey
http://mo.water.usgs.gov/

Kansas City District Corps of Engineers
http://www.mvs.usace.army.mil/

Missouri Department of Conservation
http://www.mdc.mo.gov/fish/watershed/fabius/contents/110cotxt.htm

US Environmental Protection Agency
http://www.epa.gov/region7/water/index.htm